

EMORY UNIVERSITY SCHOOL OF MEDICINE STANDARD CURRICULUM VITAE

Revised: April 21, 2020

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4. **Citizenship:** U.S.
5. **Current Titles and Affiliations:**
 - a. Academic Appointments:
 - i. Primary Appointments:
Associate Professor of Medicine, Division of Cardiology, Emory University
School of Medicine, 2013 – present
 - ii. Secondary Appointments
Associate Professor of Epidemiology, Emory Rollins School of Public
Health, 2013 – present
 - b. Clinical Appointments:
Staff Cardiologist, Emory University Hospital & Emory University Hospital
Midtown, 2007 – present

Co-Director, Nuclear Cardiology, Emory University Hospital. 2018 – present
 - c. Administrative Appointments:
Chief Quality Officer, Emory Heart and Vascular Center, 2018 – present
6. **Previous Academic and Professional Appointments:**
Associate in Medicine, Division of Cardiology, Duke University Medical Center,
2006 – 2007

Assistant Professor of Medicine, Division of Cardiology, Emory University School of Medicine, 2007 – 2013

Assistant Professor of Epidemiology, Emory Rollins School of Public Health, 2007 – 2013

Graduate Faculty, Emory Laney Graduate School, 2007 – 2011

Clinical Investigator, The Center for Health Research, Kaiser Permanente Georgia, 2009 – 2014

7. Previous Administrative and/or Clinical Appointments:

Staff Cardiologist, Duke University Medical Center, 2006 – 2007

Director of Quality, Division of Cardiology, Emory Healthcare, 2011 – 2015

Chief Quality Officer, Division of Cardiology, Emory Healthcare, 2015 – 2018

8. Licensures/Boards:

North Carolina, 2004 (inactive)

Georgia, 2007 (active)

9. Specialty Boards:

American Board of Internal Medicine, Internal Medicine, 2002, 2012

American Board of Internal Medicine, Cardiovascular Diseases, 2005, 2015

Certification Board of Nuclear Cardiology, 2007

10. Education:

B.Sc., Northwestern University, Robert R. McCormick School of Engineering and Applied Science (Evanston, IL). Major: Biomedical Engineering. Graduated with Highest Distinction (GPA: 4.0/4.0). 1992 – 1996

M.D., Northwestern University Medical School (Chicago, IL). Graduated Alpha Omega Alpha. 1995 – 1999

M.H.S. (Masters in Health Science), Duke University (Durham, NC). 2004 – 2006

11. Postgraduate Training:

Internship and Residency in Internal Medicine, University of Pennsylvania Medical Center, Philadelphia, PA. Program director Lisa M. Bellini, MD; 1999 – 2002

Cardiology Fellowship, Duke University Medical Center, Durham, NC. Program Director Thomas M. Bashore, MD; 2002 – 2006

Clinical Fellow in Lipidology, Duke University Medical Center, Durham, NC. Supervisor John R. Guyton, MD; 2004 – 2005

Clinical Research Fellow, Duke Clinical Research Institute, Durham, NC. Funded by a National Institutes of Health / National Heart Lung and Blood Institute T32 Training Grant. Trained in the conduct of cardiovascular randomized controlled trials and health services and outcomes research. Research mentors: Robert A. Harrington, MD, and Robert M. Califf, MD; 2004 – 2006

Chief Fellow, Duke Clinical Research Institute, Durham, NC. 2005 – 2006

Fellowship in Nuclear Cardiology, Duke University Medical Center, Durham, NC. Program Director Salvadore Borges-Neto, MD. 2006 – 2007

Clinical Research Fellow. Population Health Research Institute, McMaster University, Hamilton, ON, Canada. Trained in the conduct of randomized controlled trials on the intersection of cardiovascular and metabolic diseases and the burden of chronic diseases in developing countries. Research mentors: Salim Yusuf, MBBS, DPhil, and Hertzell Gerstein, MD, MSc. 2006 – 2007

12. Continuing Professional Development Activities:

American College of Cardiology “How to Become a Cardiovascular Investigator” program. Bethesda, MD. 2004

National Lipid Association Lipid Clinic Training Program. Orlando, FL. 2004

Advances in Prevention through Optimal Lipid Lowering (APOLLO) program. Scottsdale, AZ. 2005

39th Annual World Heart Federation Ten-Day Teaching Seminar in (Global) Cardiovascular Disease Epidemiology and Prevention. Fellow. Brisbane, Australia. 2006

Emory School of Medicine Junior Faculty Development Course. 2009

Academic Ladder Writing Program for Assistant Professors. Emory University. 2009

Emory Healthcare Quality Academy Practical Methods Course. 12-day course taught over four months that taught methods and skills for quality improvement in healthcare settings. 2012

Emory Healthcare Executive Mentorship and Talent Development Program. Emory Healthcare. 2014

Woodruff Leadership Academy, Woodruff Health Sciences Center, Emory Healthcare and Emory School of Medicine. 2014-2015

Speakeasy. Communicate to Drive Results. Three-day course on optimizing presentation and communication style. July 13-15, 2015, Atlanta, GA

LEAN in healthcare training, Emory Healthcare and Simpler Consulting. May-August 2017. Repeating the training April 2019 – present (anticipated through Jan. 2020).

13. **Committee Memberships:**

a. National and International:

Member, American College of Cardiology, Fellows-in-Training Committee, 2005 – 2008

Chair, American College of Cardiology, Fellows-in-Training Committee, Subcommittee on planning Fellows-In-Training events at the annual American College of Cardiology meeting, 2008

Chair, American College of Cardiology Diabetes Self-Assessment Program, Writing Committee for the keystone chapter “Glucose Management in Type 2 Diabetes.” 2009 – 2011

Member, American College of Cardiology National Cardiovascular Data Registry (NCDR) ACTION-GWTG Registry Research and Publications Committee. This committee helps shape the national research agenda on heart attack care by prioritizing and peer-reviewing all research proposals and manuscripts using data from the American College of Cardiology NCDR ACTION-GWTG Registry (national heart attack registry). 2013 – 2019

Member, Diabetes Collaborative Registry Research and Publications Committee. This committee helps shape the national research agenda on diabetes care by prioritizing and peer-reviewing all research proposals and manuscripts using data from the Diabetes Collaborative Registry (DCR), a diabetes registry jointly supported by the American College of Cardiology, American Diabetes Association, American Association of Clinical Endocrinologists, and the Joslin Diabetes Center. 2015 – present

Member, American Heart Association Quality of Care and Outcomes Research (QCOR) Council Membership and Communications Committee. 2016 – present

Member, Center for Medicare and Medicaid Innovation Ad-hoc Advisory Panel on AMI Payment Models. August 2017 – present

Member, American College of Cardiology National Cardiovascular Data Registry Metrics and Reporting Methodology Subcommittee. January 2018 – present

Member, American Heart Association Quality of Care and Outcomes Research (QCOR) Council Science and Clinical Education Lifelong Learning (SCILL) Committee. 2018 – present

Member, American Heart Association Coronary Artery Disease Systems of Care Advisory Group. 2018 – present

Steering Committee and Member, American College of Cardiology Type 2 Myocardial Infarction Roundtable. 2019 – present

Member, American College of Cardiology Partners in Quality Committee. April 1, 2020 – March 30, 2023.

b. Regional and State:

Member, Institutional Review Board, Kaiser Permanente Georgia 2009 – 2011

Co-chair, Atlanta American Heart Association Mission: Lifeline. Data and Quality Improvement Subcommittee. 2012 – 2014

Co-chair, Atlanta American Heart Association Mission: Lifeline program. 2014 – present

Member, Advisory Committee to the Georgia Department of Public Health Commissioner's Office for implementation of the Georgia Emergency Cardiac Care Centers legislation. 2017 – present

c. Institutional:

(not including institutional committee memberships through Chief Quality Officer role, which are listed separately in item 19b)

Chair, Faculty Development Committee, Emory Rollins School of Public Health, Department of Epidemiology. Drafted a policy for mentoring and developing junior faculty, adopted by the Department of Epidemiology. 2008

Interviewer, Doctoral Training Program, Emory Rollins School of Public Health, Department of Epidemiology (estimated 6 hours per year), 2008 – 2010

Interviewer, Emory Cardiology Fellowship Training Program (estimated 6 hours of service per year), 2009 – 2017

Judge for research posters presented at Emory School of Medicine Department of Medicine Research Day. 2012, 2014, 2017

Presentation consultant, Faculty Development Committee, School of Medicine, 2013 – present

Member, Planning Committee, Emory Department of Medicine's Advancing Healthcare Quality Research conference, 2013 – 2014.

Member, Core Faculty, Emory University Hospital, Accreditation Council for Graduate Medical Education (ACGME) Clinical Learning Environment Review (CLER) site visit. May 14, 2014.

Member, Search Committee for Division Director of Hospital Medicine, Emory University School of Medicine. 2014.

Member, Emory Healthcare MACRA Response Committee. 2016 – present.

Judge for research posters presented at the Georgia CTSA Annual Health Services Research Day. 2018, 2019

14. Peer review activities:

a. Grants

i. Institutional:

Grant reviewer, KL2 study section, Emory University, 2010

b. Manuscripts

American Heart Journal
American Journal of Cardiology
BMC Health Services Research
British Medical Journal (The BMJ)
Circulation
Circulation: Cardiovascular Quality and Outcomes
Clinical Cardiology
Diabetes and Vascular Disease Research

Diabetes Care
European Heart Journal
Heart
International Journal of Cardiology
JAMA Cardiology
JAMA Internal Medicine (formerly Archives of Internal Medicine)
JAMA: Journal of the American Medical Association
Journal of the American College of Cardiology
Journal of the American College of Cardiology: Cardiovascular Interventions
Journal of Cardiac Failure
Journal of Clinical Lipidology
Journal of Diabetes and its Complications
New England Journal of Medicine
Stroke

c. Conference abstracts

i. National and International:

American Heart Association Scientific Sessions. Abstract reviewer. 2010 – 2015

American Heart Association Quality of Care and Outcomes Research Scientific Sessions. Abstract reviewer. 2013 – 2015

American Heart Association Quality of Care and Outcomes Research Scientific Sessions. Poster discussant. 2013.

American College of Cardiology Annual Conference. Abstract reviewer. 2014 – 2015

15. Consultantships / Advisory Boards:

Member, Advisory Board, ZS Pharma, 2014, 2016.

16. Honors and Awards:

James A. Patten Award. Highest undergraduate academic performance among the 71 Northwestern University graduates entering Northwestern University Medical School. 1995

Graduation with Highest Distinction. Top 2% in the School of Engineering and Applied Science, Northwestern University. 1996

Alpha Omega Alpha, Northwestern University Medical School, 1998

Edward W. Holmes Resident Research Award. University of Pennsylvania Medical Center. For outstanding research in the area of patient-oriented research. 2002

Second place, Clinical Research Fellow national competition. Northwestern University Feinberg School of Medicine Cardiovascular Young Investigators Forum. "Drop in glucose level following acute myocardial infarction predicts improved survival in nondiabetic patients, regardless of baseline glucose level." 2005

Finalist, Clinical Research Fellow national competition. Northwestern University Feinberg School of Medicine Cardiovascular Young Investigators Forum. "Greater Use of Secondary Prevention Medications Following Coronary Artery Bypass Graft Surgery is Associated with Improved Two-Year Outcomes." 2006

Jeremiah Stamler Distinguished Young Investigator Award. Grand Prize, Clinical Research Faculty national competition. Northwestern University Feinberg School of Medicine Cardiovascular Young Investigators Forum. "Elevated in-hospital glucose level, and not known history of diabetes mellitus, predicts 30-day mortality following acute ST-elevation myocardial infarction in 30,536 patients." Awarded \$10,000 in research funding. 2007

Recipient, American Association of Cardiologists of Indian Origin Young Investigator Award. "Differential Clinical Outcomes Associated With Hypoglycemia and Hyperglycemia in Acute Myocardial Infarction." 2009

Finalist, American College of Cardiology Annual Scientific Sessions 2009 Young Investigators Competition. "Differential Clinical Outcomes Associated With Hypoglycemia and Hyperglycemia in Acute Myocardial Infarction." 2009

Finalist, American Heart Association Annual Scientific Sessions 2009 Elizabeth Barrett-Connor Research Award for Young Investigators. "The Impact Of Attained Educational Level On Incident Cardiovascular Events Differs Between High-Income Countries and Low-and-Middle-Income Countries." 2009

Fellow of the American College of Cardiology (FACC). 2010

Finalist, American Schools of Public Health / Pfizer Young Investigator's Award for Distinguished Research in Public Health. "Attained educational level and incident atherothrombotic events in low-and-middle income compared with high-income countries." 2011

Outstanding Scientific Citation for Early Career Faculty Award in Clinical and Translational Research. Emory School of Medicine, Department of Medicine. 2012 (Awarded for the publication: **Goyal A**, Spertus JA, Gosch K, Venkitachalam L, Jones PG, van den Berghe G, Kosiborod M. Serum potassium levels and mortality in acute myocardial infarction. *JAMA*. 2012; 307: 157-64.)

Outstanding Quality Achievement Award. Emory School of Medicine, Department of Medicine. 2013.

Fellow of the American Heart Association (FAHA). Quality of Care and Outcomes Research (QCOR) Council. 2014.

Fellow, Woodruff Leadership Academy, Woodruff Health Sciences Center (Emory Healthcare and Emory School of Medicine). October 2014 to April 2015.

Recipient, Emory University School of Medicine Dean's research award. \$50,000 in project support. 2014.

Mentor to Dr. Eric Y. Shin (Emory Cardiology Fellow), the Grand Prize Winner of the 2017 American Heart Association Quality of Care and Outcomes Research Conference Young Investigator Award competition, Arlington, VA. "Electronic health record-based overestimation of failure to prescribe statins in patients with coronary artery disease in a large, academic, multispecialty clinic practice." April 3, 2017.

Distinguished Physician. Emory University School of Medicine, Department of Medicine. 2017.

Hidden Gem Award. Emory School of Medicine, Department of Medicine. 2019. Honors faculty with outstanding and impactful contributions in any of the Department of Medicine mission areas, whose significant contributions may escape external recognition.

17. **Society Memberships:**

American Heart Association (Council of Quality of Care and Outcomes Research; and Council of Nutrition, Physical Activity, and Metabolism), 2007 – present

American College of Cardiology, 2007 – present

18. **Organization of Conferences:**

a. National and International:

American College of Cardiology National Cardiovascular Data Registry (NCDR) Annual Conference Interprofessional Practice Curriculum Planning Workgroup. 2014, 2016, 2017, 2018

American College of Cardiology National Cardiovascular Data Registry (NCDR) Annual Conference Curriculum Development Workgroup. 2017, 2018

b. Regional:

Organizing Committee, Atlanta American Heart Association Mission: Lifeline Annual STEMI (heart attack) Conference. Atlanta, GA. 2015-2017, 2019
Director, Organizing Committee 2019

19. Clinical Service and Clinical Quality Contributions:

a. Clinical Service Contributions:

General Cardiology Teaching Service Attending, Emory University Hospital Midtown & Emory University Hospital, 4-6 weeks per year, 2007 – present

CCU Service Attending, Emory University Hospital Midtown, 4 weeks per year, 2009 – present

Nuclear Cardiology Laboratory Attending, Emory University Hospital & Emory University Hospital Midtown, 1 day / week, 2007 – present

Co-Director, Nuclear Cardiology Laboratory, Emory University Hospital, 2018 – present

b. Clinical Quality Contributions (through Chief Quality Officer / Director role)

Physician Director, STEMI (heart attack) protocol development for pre-hospital cardiac catheterization laboratory activation, healthcare staff training, and STEMI case review. Emory University Hospital, and Emory University Hospital Midtown. 2011 – present

Physician Director, American Heart Association Mission: Lifeline (heart attack network) program oversight for STEMI and NSTEMI (heart attack) patients. Emory University Hospital, Emory University Hospital Midtown, Emory Saint Joseph's Hospital, Emory Johns Creek Hospital. 2011 – present

Physician Director, American College of Cardiology National Cardiovascular Data Registries (ACC NCDR). Provide physician leadership and oversight for Emory Hospitals' participation, contract review, data collection, and performance in several ACC NCDR registries, including the ACTION / Chest Pain-MI Registry (heart attack patients); CathPCI Registry (cardiac catheterization laboratory procedures); ICD Registry (defibrillator implantation procedures); and LAAO Registry (left atrial appendage occluder procedures). Emory University Hospital, Emory University Hospital Midtown, Emory Saint Josephs Hospital of Atlanta, and Emory Johns Creek Hospital. 2011 – present

Physician Champion, cardiac catheterization (cath) laboratory process and outcomes improvement, Emory Hospitals. Lead teams to reduce the rate of

inappropriate cath lab procedures, and to reduce rates of mortality, bleeding, and acute kidney injury following interventional cath lab procedures. Create and disseminate interventional cardiology physician dashboards annually. Emory University Hospital, Emory University Hospital Midtown, Emory Saint Josephs Hospital of Atlanta, and Emory Johns Creek Hospital. 2011 – present

Physician Champion, development and optimization of EMR order sets, note templates, and checklists to: 1) maximize prescription rates indicated pharmacologic therapies at hospital discharge following heart attacks and cardiac procedures; 2) maximize referral rates to outpatient cardiac rehabilitation following heart attacks, coronary revascularization procedures, and valve procedures; and 3) ensure compliance with Medicare National Coverage Determinations (NCD) criteria for cardiac defibrillator implants. Emory University Hospital, Emory University Hospital Midtown, Emory Saint Josephs Hospital of Atlanta, and Emory Johns Creek Hospital. 2011 – present

Cardiology Team Lead, ambulatory LDL cholesterol control improvement, The Emory Clinic (TEC). Achieved substantial gains within TEC's cardiology clinics for the rate of LDL cholesterol control. 2012 – 2015

Cardiology representative, Clinical Excellence Executive Operations Committee, Emory Healthcare Hospitals. Recurring presentations regarding Emory hospitals' performance in cardiology quality metrics to hospital and clinic leadership related to heart attacks and invasive cardiology procedures. Emory University Hospital (2011 – present), Emory University Hospital Midtown (2011 – 2018), Emory Saint Josephs Hospital of Atlanta (2013 – present).

Chair, cardiology quality metric development, Emory Clinically Integrated Network. The Emory CIN is Emory Healthcare's initiative to develop an accountable care organization of both primary and specialty outpatient providers across the greater metro Atlanta area. Summer 2012

Physician Director, American Heart Association (AHA) Mission: Lifeline STEMI Accreditation. Led multidisciplinary team to earn this accreditation for comprehensive excellence in heart attack care. Emory Healthcare was the first health system to earn this accreditation in AHA's Greater Southeast Affiliate (a 7-state region). Emory University Hospital and Emory University Hospital Midtown, 2013

Physician Co-Director, Value Acceleration Project, Stenting. Directed an interdisciplinary team to reduce variability and improve efficiencies in the cardiac catheterization labs of Emory Healthcare, and thereby reduced annual operating expenses for our cath labs by an estimated \$1 million over a three-year period. 2014 – 2016

Cardiology physician representative, MACRA Response Committee for The Emory Clinic. 2015 – 2017

Cardiology physician lead, Medicare Appropriate Use Criteria (AUC) Imaging Mandate. Lead physician from the Division of Cardiology to help Emory Healthcare educate physicians regarding Medicare's new AUC Imaging Mandate, and choose a Clinical Decision Support Mechanism (CDSM) that all outpatient providers must use when ordering imaging studies. 2016 – 2017

Physician Director, Value Acceleration Project (VAP) for Acute Myocardial Infarction (AMI) Bundles. Directed an interdisciplinary team across our four-hospital system to reduce variability and improve efficiencies in the care of patients with AMI from hospital arrival through 90 days after discharge, in preparation for Medicare's AMI bundled payment program. Initiative saved Emory Healthcare \$1,050,930 over two fiscal years. 2017 – 2019

Physician Director, Emory acute myocardial infarction (heart attack) classification, documentation, and coding algorithm. Led a team that developed an Emory standard for classifying, documenting, and coding myocardial infarctions (heart attacks). Continually educate of healthcare providers and trainees across Emory Healthcare on the correct documentation of different heart attack types. Train CDI physician directors at each campus in Emory's myocardial infarction classification scheme. Lead CDI and coding teams to adjudicate in real-time the medical records of all heart attack patients at Emory Hospitals. 2017 – present.

Cardiology Lead, implementation of high-sensitivity troponin assay across Emory Healthcare hospitals. 2019 – present.

20. **Community Outreach:**

Physician Director, South Asian Indian (Gujarati) health convention. Directed and conducted health screenings (cardiovascular risk screening, blood pressure checks, cholesterol checks) for attendees. Lectured on healthy living and how to make Indian food healthier. 2008

21. **Formal Teaching:**

a. Medical Student Teaching:

"Integrating quality improvement in your career as a healthcare professional."
One-hour long lecture delivered annually to interested students. 2014 – 2016.

b. Graduate Programs:

i. Residency Programs:

Family Medicine Resident lecture, Emory School of Medicine. “Cardiology Topics: How a Cardiologist Thinks about Common Inpatient Problems.” February 26, 2015

Family Medicine Resident Lecture, Emory School of Medicine. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” December 7, 2017.

Internal Medicine Resident Conference. Emory University Hospital and Grady Memorial Hospital. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” Given three times. November 16, 2017 (EUH); March 1, 2019 (EUH); March 6, 2019 (GMH)

ii. Fellowship Programs:

Endocrine Fellows Society. Duke University Medical Center. “The metabolic effects of beta-blockers and ACE inhibitors.” May 6, 2005

Cardiology Fellows Conference, Emory University Hospital. “How to Pass the Cardiology Board Examination.” March 19, 2008

Cardiology Fellow Conference, Emory University Hospital. “Cardiology Fellows Conference: Orientation to Quality.” One-hour lecture given to general cardiology fellows annually. 2013 – present

Interventional Cardiology Fellow Conference, Emory University Hospital. “Interventional Fellows Quality Orientation.” One-hour lecture given to interventional cardiology fellows annually. 2013 – present

iii. Master’s and PhD Programs:

Course Director. Fundamentals of Epidemiology, Certificate Program in Translational Research, Emory School of Medicine. Developed and taught (as the sole instructor) this one-semester, two-credit-hour course to Emory graduate students. Evaluated by students as one of the most highly rated classes taught within the Certificate Program. 2010 – 2013.

Course Director. MPH Journal Club, Emory Rollins School of Public Health. Developed and taught this one- semester, one-credit-hour course to Masters students in the Department of Epidemiology. Directed this course for three semesters. Fall 2010, Spring 2011, Fall 2011

Cardiovascular Disease Epidemiology (course director Dr. William McClellan), Department of Epidemiology, Emory Rollins School of Public

Health. Lecture entitled, “Inflammation and Coronary Heart Disease” (2 hours per year). 2008 – 2017

Grader, Epidemiology PhD qualifying exams. Cardiovascular Disease Epidemiology and Chronic Disease Epidemiology courses (course director Dr. William McClellan), Department of Epidemiology, Emory Rollins School of Public Health. 2008 – 2013.

c. Other Categories:

Panelist. Health Care Quality and Patient Safety. Course Directors Dr. Nathan O. Spell III and Dr. Bonnie Jennings. Emory School of Nursing. September 11, 2012.

Nursing lecture, Emory University Hospital Midtown. “Telemetry in-service.” July 2, 2013.

Director, Nuclear Cardiology CME series, Emory University Hospital Midtown. Developed the curriculum for monthly CME lectures in nuclear cardiology (cardiac SPECT and PET imaging) at EUHM. 2013 – 2019.

Presenter, American Medical Response, Atlanta, GA. “The role of EMS in the care of the STEMI patient”. May 23, 2014.

22. Supervisory Teaching:

a. Ph.D. Students Directly Supervised as primary academic advisor (name, years supervised, current title)

Ambar Kulshreshtha, MD, PhD 2008 – 2013
Assistant Professor, Department of Family Medicine, Emory School of Medicine

Ritam Chowdhury, MD, PhD 2009 – 2012
Independent biostatistical consultant

b. Postdoctoral Fellows Directly Supervised (name, years supervised, current title)

Catherine Norton, MD 2009 – 2010 Private practice cardiologist

Bradley C. Witbrodt, MD 2014 – 2019 Private practice cardiologist

Joe X. Xie, MD 2015 – present Cardiology fellow, Emory

Eric Y. Shin, MD 2015 – 2018 Cardiology fellow, Emory

c. Residency and Fellowship programs

Teaching Attending Physician on the General Cardiology Service, Cardiac Intensive Care Unit, and Nuclear Cardiology SPECT and PET laboratories (total 30% of my professional time), Emory Cardiology Fellowship Training Program, Emory University Hospital and Emory University Hospital Midtown, 2007 – present

Teaching Attending Physician on the General Cardiology Service, Emory Internal Medicine Program, Emory University Hospital and Emory University Hospital Midtown, 2007 – present

d. Ph.D. dissertation committees (name, years supervised, current title)

Winn T. Cashion, MD, PhD 2010 – 2013
Nephrology fellow, University of Pittsburgh Medical Center

Ambar Kulshreshtha, MD, PhD 2011 – 2013
Assistant Professor, Department of Family Medicine, Emory School of Medicine

e. Other: Masters thesis advisor (name, years supervised, current title)

Zhaochuan Wang, MPH 2013
Senior Clinical Research Associate Lead, ICON Plc (a clinical research organization for drug development)

23. Lectureships, Seminar Invitations, and Visiting Professorships

a. National and International

Madras Diabetes Research Foundation, Chennai, India. “Elevated in-hospital glucose level in acute myocardial infarction: a prognostic marker and potential target of therapy.” January 7, 2008.

Department of Community and Family Medicine, Surat Medical College, Gujarat, India. “Doctoral programs in public health in the United States.” March 26, 2010.

Department of Medicine, Surat Medical College, Gujarat, India. “Medical training in the United States for International Medical Graduates.” March 26, 2010.

National Heart, Lung, and Blood Institute, Bethesda, MD. “Glucose levels, insulin therapy, and prognosis in acute coronary syndromes.” August 30, 2010.

24. Invitations to National / International, Regional, & Institutional Conferences

a. National

Co-Chair, Fellows Bootcamp, American College of Cardiology 2008. “What do you need to know about cardiac magnetic resonance imaging and nuclear cardiology?” Chicago, IL, April 1, 2008.

Chair, Vascular Biology Working Group symposium. “Evidence-based recommendations in hyperglycemia in acute coronary syndromes: clinical workshop.” Atlanta, GA, April 21, 2009.

American Heart Association Scientific Sessions 2008, New Orleans, LA. “Ask the Experts: Hyperglycemia in Acute Coronary Syndromes.” November 11, 2008.

American College of Cardiology Annual Scientific Sessions 2008-2011, Fellows in Training Session. “How to pass the cardiology boards.” 2008-2011. (Gave lecture for four consecutive years.)

Plenary Session, American College of Cardiology Annual Scientific Sessions 2011, New Orleans, LA. “Optimizing A1C levels in the diabetic patient.” April 4, 2011.

Vasculata 2011. “Fundamentals of cardiovascular epidemiology.” July 29, 2011.

American College of Cardiology Annual Scientific Sessions 2013, San Francisco, CA. “Less is more – when not to use glucose lowering medications.” March 11, 2013.

American Heart Association Annual Scientific Sessions 2013, Dallas, TX. “Starting an institutional quality improvement project: nuts and bolts.” November 16, 2013.

National Cardiovascular Data Registry Annual Conference 2014, Washington, DC. “Enhancing physician and administrator engagement in your NCDR registries.” March 28, 2014.

UHC Joint Council 2014, Chicago, IL. “Mobilizing an academic medical center’s faculty practice to accelerate gains in ambulatory quality metrics.” May 8, 2014.

American Heart Association Annual Scientific Sessions 2014, Chicago, IL. “Is hypoglycemia a marker or mediator of increased cardiovascular risk in hospitalized patients?” November 17, 2014.

National Cardiovascular Data Registry Annual Conference 2016, Chicago, IL. “Role of registry stakeholders: the health system perspective.” March 31, 2016.

National Cardiovascular Data Registry Annual Conference 2016, Chicago, IL. “Leveraging NCDR data to engage physicians.” April 1, 2016.

Complex Cardiovascular Catheter Therapeutics 2016, Orlando, FL. “Quality metrics in STEMI care: broadening our view beyond Door-to-Balloon.” June 29, 2016.

Session moderator and speaker. National Cardiovascular Data Registry Annual Conference 2017, Washington, DC. “Changing Behavior in Service to Quality Improvement—What’s Required.” March 14, 2017.

Session panelist and speaker. National Cardiovascular Data Registry Annual Conference 2017, Washington, DC. “Financial and Operational Challenges for Registry Participation.” March 14, 2017.

Session moderator and speaker. National Cardiovascular Data Registry Annual Conference 2018, Washington, DC. “What’s Your Type? Demystifying Type 2 Myocardial Infarction.” March 9, 2018.

Speaker. ACDIS national webinar conference. (ACDIS is the Association of Clinical Documentation Improvement Specialists, and it is the national society for professional clinical documentation specialists.) “Myocardial Infarction 4th Universal Definition: Tools for CDI, Coding, and Physician Collaboration.” National webinar. February 12, 2019.

Speaker. AHIMA Clinical Documentation Improvement Summit 2019. (AHIMA is the American Health Information Management Association, and it is the national society for professional healthcare coders.) “The Emory Algorithm for Defining and Documenting Acute MI and non-MI Causes of Elevated Troponin Levels.” Chicago, IL. July 14, 2019.

Speaker and Panelist, American College of Cardiology 2020. Session title: What's in a Name? Practicalities of the 4th Universal Definition of Myocardial Infarction. Lecture title: Translating The 4th UDMI Into Clinical Documentation For Front-Line Clinicians And Health Systems. Scheduled for March 29, 2020, Chicago, IL.

Speaker. ACDIS national annual conference 2020. “AMI Algorithm and Adjudication a CDI Special Focus for Quality Impact.” Was scheduled for May 7, 2020, Las Vegas, NV, will be rescheduled to autumn 2020 because of COVID-19 pandemic.

Speaker, Plenary Session. American Heart Association Quality of Care and Outcomes Research (AHA QCOR) 2020 Annual Conference. “CMS’ value based program: where are we and where are we going with it? Insights and lessons learned from safety net hospitals on implementing value based programs.” Originally scheduled for May 15, 2020 in Reston, VA as an in-person presentation, but has been changed to a virtual speaking session because of COVID-19 pandemic.

b. Regional

Duke Advanced Lipid Preceptorship. “The metabolic effects of beta-blockers and ACE inhibitors.” 2004 – 2006

Emory Symposium on Coronary Atherosclerosis Prevention and Education, 8th annual symposium, Amelia Island, Florida. “Hyperglycemia in acute coronary syndromes: a target for intervention, or only a marker of risk?” June 4, 2009.

Atlanta Clinical Cardiology Update, Atlanta, GA. “Quality, appropriateness, and reimbursement: recent developments and future directions.” January 26, 2013.

Atlanta Clinical Cardiology Update, Atlanta, GA. “The emerging importance of quality and performance evaluation.” December 6, 2013.

Atlanta Clinical Cardiology Update, Atlanta, GA. Invited speaker. “Engaging physicians (and administrators) in quality improvement.” February 27, 2015.

Atlanta American Heart Association Mission: Lifeline Annual STEMI (heart attack) Conference. Atlanta, GA. “Atlanta Mission: Lifeline Successes and STEMI Metrics.” Atlanta, GA. 2015 – 2017

Panelist. Emory Practical Interventions Course Southeastern Consortium (EPIC-SEC), Atlanta, GA. “Changing healthcare landscape and the quality imperative.” May 1, 2015.

Panelist. Emory Practical Interventions Course Southeastern Consortium (EPIC-SEC), Atlanta, GA. “The cath lab quality imperative.” March 3, 2016.

Atlanta Clinical Cardiology Update, Atlanta, GA. “Medicare payment reform: from fee-for-service to value-based care to alternative payment models.” April 16, 2016.

Panelist and Speaker. Emory Practical Interventions Course Southeastern Consortium (EPIC-SEC), Atlanta, GA. "Quality Payment Program: Merit-based Incentive Payment System (MIPS) track." April 20, 2017.

Moderator and Speaker. Atlanta American Heart Association Mission: Lifeline Annual STEMI (heart attack) Conference. Part of the Metro Atlanta Emergency Medicine Services Conference (MAEMSC). "STEMIs and STEMI mimickers: case records from Emory University Hospital and Emory University Hospital Midtown." Atlanta, GA. March 8, 2019

Moderator and Speaker. Atlanta American Heart Association Mission: Lifeline Annual STEMI (heart attack) Conference. Part of the Metro Atlanta Emergency Medicine Services Conference (MAEMSC). "STEMIs and STEMI mimickers: case records from Emory University Hospital and Emory University Hospital Midtown." Atlanta, GA. Was scheduled for April 3, 2020, but this has been deferred to August 2020 because of the COVID-19 pandemic.

Speaker. Emory Practical Interventions Course Southeastern Consortium (EPIC-SEC), Atlanta, GA. "New Definitions of Myocardial Infarction." Was scheduled for April 18, 2020, but this has been deferred to August 2020 because of the COVID-19 pandemic.

Speaker. 2020 American Heart Association Southeast Heart & Stroke Quality Summit. "Diagnosing Type 2 MI versus NSTEMI." Was scheduled for April 21, 2020, but this was cancelled due to the COVID-19 pandemic.

c. Institutional

Department of Medicine Grand Rounds, Grady Memorial Hospital. "Glucose levels and prognosis in acute coronary syndromes." April 3, 2008.

Department of Medicine Research Rounds, Atlanta VA Medical Center. "Glucose levels and prognosis in acute coronary syndromes." April 9, 2008.

EPICORE Cardiovascular Epidemiology Research Conference, Emory University Hospital. "Glucose levels and prognosis in acute coronary syndromes." April 11, 2008

Cardiology Grand Rounds, Emory University Hospital. "Glucose levels and prognosis in acute myocardial infarction." September 19, 2008.

Endocrinology Grand Rounds, Emory University Hospital. "Glucose levels, insulin therapy, and prognosis in acute myocardial infarction." March 2, 2009.

Medical-Surgical Rounds, Emory University Hospital Midtown. "Hyperglycemia in acute coronary syndromes: a target for intervention, or only a marker of risk?" June 9, 2009.

EPICORE Cardiovascular Epidemiology Research Conference, Emory University Hospital. "The impact of attained educational level on incident cardiovascular events differs between high-income countries and low-and-middle-income countries." November 6, 2009.

Cardiology Grand Rounds, Emory University Hospital. "Review of American Heart Association 2008 highlights." November 14, 2009.

Medical-Surgical Rounds, Emory University Hospital Midtown. "Should cardiovascular specialists care about glycemic control in outpatients with diabetes?" May 25, 2010.

Research Rounds, Atlanta VA Medical Center. "Glucose levels, insulin therapy, and prognosis in acute coronary syndromes." October 1, 2010

Emergency Medicine Faculty Rounds, Emory University Hospital and Emory University Hospital Midtown. "ACTION Registry and the American Heart Association Mission Lifeline program." November 2011.

Interventional Cardiology Conference, Emory University Hospital. "CathPCI Registry and Appropriate Use Criteria." December 14, 2011.

Grady Memorial Hospital Medical Grand Rounds. "Serum potassium levels and mortality in acute myocardial infarction." May 7, 2012.

Cardiology Grand Rounds, Emory University Hospital. "Serum potassium levels and mortality in acute myocardial infarction." October 15, 2012.

Emory Department of Medicine Research Day. "Serum potassium levels and mortality in acute myocardial infarction." October 26, 2012.

Cardiology Grand Rounds, Emory University Hospital. "Performance in acute myocardial infarction care and cardiac cath lab care at Emory University Hospital and Emory University Hospital Midtown." January 18, 2013.

Cardiology Grand Rounds, Emory University Hospital. "Performance in outpatient care, readmissions, and cardiology quality update." May 3, 2013.

Cardiology Grand Rounds, Emory St. Joseph's Hospital of Atlanta. "Cath lab and acute MI performance at St. Joseph's Hospital: successes and opportunities." December 4, 2013.

Cardiology Grand Rounds, Emory University Hospital. “Integrating quality improvement in your career as a cardiologist.” February 7, 2014.

Advancing Healthcare Quality Research at Emory University conference. “Appropriate Use Criteria for Revascularization: Optimizing Processes of Care.” May 28, 2014.

Cardiology Grand Rounds, Emory University Hospital. “Medicare payment reform, and cardiology quality at Emory: 2015 and beyond.” November 2, 2015.

Emory Healthcare Network Quality Management Forum. “Steps taken in interventional cardiology to improve value.” November 4, 2015.

Advancing Healthcare Quality Research at Emory University conference. “Creation of a regional network to reduce time to definitive treatment in STEMI (heart attack) patients.” May 18, 2016.

Emory Healthcare Cardiology Nursing Invited Lecture. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” September 28, 2017.

Emory University Hospital Midtown Division of Hospital Medicine Invited Lecture. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” October 12, 2017.

Emory Johns Creek Hospital Division of Hospital Medicine Grand Rounds . “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” 2017, 2019

Emory Healthcare Clinical Documentation Initiative and Coding Conference. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” June 1, 2018.

Emory University Hospital Midtown Medicine Grand Rounds. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” June 8, 2018.

Kaiser Permanente Georgia Cardiology Conference. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” Atlanta, GA. November 14, 2018.

Emory Johns Creek Hospital Hospital Medicine Grand Rounds. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” Johns Creek, GA. May 31, 2019.

Kaiser Permanente Georgia Hospital Medicine Conference. “Defining Acute Myocardial Infarction: the New Nomenclature of Elevated Troponin Levels.” Emory Saint Joseph’s Hospital of Atlanta. June 20, 2019.

Emory Department of Medicine Grand Rounds. “Optimization of Cardiometabolic Care for Diabetic Patients: 3 Cases.” Emory University Hospital. October 1, 2019.

25. **Abstract presentations, unpublished**

(This section does not include abstracts that have been published in conference proceedings or journals; these are listed separately in item 28e below)

† Publication in which one of Dr. Goyal’s mentees is an author

1. † Kulshreshtha A, Veledar E, **Goyal A**, Vaccarino LV. Recent trends in coronary heart disease (CHD) deaths in the US elderly population. Poster presentation at the American Heart Association Epidemiology conference in March 2010.
2. Huang C, **Goyal A**, Redmon P, Koplan JP, Eriksen MP. Building Programs of Excellence in Research and Scholarship in Tobacco Control in China. Poster presentation at the 15th World Conference on Tobacco or Health, Singapore, March 23, 2012.
3. **Goyal A**, Casey M, McDaniel M, Fazel R, Liberman H, Picardo N, Spell NO, Shaw L, Samady S. Reducing the proportion of “nonclassifiable” percutaneous coronary intervention procedures for Appropriate Use Criteria reporting in two teaching hospitals. Poster presentation, the American College of Cardiology National Cardiovascular Data Registry 2013 Annual Conference, March 7-8, 2013, San Francisco, CA.
4. † Xie JX, Casey M, Liberman H, Lieppe W, McDaniel M, Rab T, Robertson GC, Samady H, Shaw LJ, **Goyal A**. Reducing inappropriate percutaneous coronary intervention procedures in a multi-hospital, academic healthcare system. Accepted as a poster abstract to the American College of Cardiology National Cardiovascular Data Registry 2016 conference, Chicago, IL, March 2016.

26. **Research Focus:**

I have three primary research foci. 1) Clinical trials and epidemiology of diabetes and cardiovascular disease. 2) Cardiovascular outcomes research. 3) Research on the delivery of care, process improvement, advocacy, and policy in cardiovascular medicine.

27. **Grant Support:**

a. Previous support

i. Federally funded

Fellow, T32 Training Grant. Duke Clinical Research Institute. P.I. Daniel B. Mark MD. 2004 – 2006

Principal Investigator, National Institutes of Health Atlanta Clinical Translational Science Institute. *Achievement and knowledge of cardiovascular risk factor goals in adults with type 1 compared with type 2 diabetes mellitus*. University Research Committee award. \$42,000. 2009 – 2010.

Co-investigator, National Institutes of Health / National Center for Complementary and Alternative Medicine. *Melatonin and the metabolic syndrome*. R21 AT004220-01A2. P.I. Dr. Michael Kutner. \$400,000 direct costs, 6% effort. 2009 – 2012.

Co-investigator, National Institutes of Health / National Heart Lung Blood Institute. *ISCHEMIA trial imaging substudy*. P.I. Leslee Shaw, PhD. 10% effort from 3/16 to 2/17.

ii. Private foundation funded

Co-investigator, Bill and Melinda Gates Foundation. *Global tobacco technical assistance consortium*. Research grant. P.I. Dr. Jeffrey P. Koplan. \$13,956,993, 6% effort. 2010 – 2012.

Principal Investigator, American College of Cardiology Foundation. Harry B. Graf Endowment Fund Career Development Award for Heart Disease Prevention. *Application of metabolomics to discover biomarkers that predict severe coronary artery disease in patients with and without the metabolic syndrome*. \$65,000. 2006 – 2007.

iii. Institutional support

Recipient, Emory University School of Medicine Dean's research award. \$50,000 in project support. 2014 – 2019.

iv. Contracts

Consultant, Lockheed Martin Corporation. *Development of an epidemiological methodology examining cause-effect relationships between health risks and disease incidence and prevalence in chronic heart disease*.

Grant to Emory University Institute for Health and Productivity Studies. P.I.
Dr. Ron Z. Goetzel. 11% effort. 2010 – 2011.

28. Bibliography:

* Publication in which Dr. Goyal is the corresponding author

† Publication in which one of Dr. Goyal's mentees is an author

a. Published and Accepted Research Articles in Refereed Journals

1. **Goyal A**, Samaha FF, Boden WE, Wade MJ, Kimmel SE. Stress test criteria used in the conservative arm of the FRISC-II trial underdetects surgical coronary artery disease when applied to patients in the VANQWISH trial. *J Am Coll Cardiol.* 2002; 39: 1601-7.
2. Samaha FF, Kimmel SE, Kizer JR, **Goyal A**, Wade M, Boden WE. Usefulness of the TIMI risk score in predicting both short- and long-term outcomes in the Veterans Affairs Non-Q-Wave Myocardial Infarction Strategies In-Hospital Trial. *Am J Cardiol.* 2002; 90: 922-6.
3. Alexander JH, Hafley G, Harrington RA, Peterson ED, Ferguson TB Jr., Lorenz TJ, **Goyal A**, Gibson M, Mack MJ, Gennevois D, Califf RM, and Kouchoukos NT, for the PREVENT IV Investigators. Efficacy and safety of edifoligide, an E2F transcription factor decoy, for the prevention of vein graft failure following coronary artery bypass graft surgery. *JAMA.* 2005; 294: 2446-54.
4. * **Goyal A**, Mahaffey KW, Garg J, Nicolau JC, Hochman JS, Weaver WD, Theroux P, Oliveira GB, Todaro TG, Mojcik CF, Armstrong PW, Granger CB. Prognostic significance of the change in glucose in first 24 hours after acute myocardial infarction: results from the CARDINAL study. *Eur Heart J.* 2006; 27: 1289-97.
5. **Goyal A**, Alexander JH, Hafley GE, Graham SH, Mehta RH, Mack MJ, Wolf RK, Cohn LH, Kouchoukos NT, Harrington RA, Gennevois D, Gibson CM, Califf RM, Ferguson Jr., TB, Peterson ED. Outcomes associated with the use of secondary prevention medications following coronary artery bypass graft surgery. *Ann Thorac Surg.* 2007; 83: 993-1001.
6. * Díaz R, **Goyal A (shared first author and corresponding author)**, Mehta S, Afzal R, Xavier D, Pais P, Chrolavicius S, Zhu J, Kazmi K, Liu L, Budaj A, Zubaid M, Avezum A, Ruda M, Yusuf S. Glucose-insulin-potassium (GIK) therapy in patients with ST-segment elevation myocardial infarction. *JAMA.* 2007; 298: 2399-2405.

7. Chen K, Lindsey JB, Khera A, de Lemos JA, Ayers CR, **Goyal A**, Vega GL, Murphy SA, Grundy SM, McGuire DK. Independent associations between metabolic syndrome, diabetes mellitus and atherosclerosis: observations from the Dallas Heart Study. *Diabetes Vasc Dis Res*. 2008; 5: 96-101.
8. Yau JM, Alexander JH, Hafley G, Mahaffey KW, Mack MJ, Kouchoukos N, **Goyal A**, Peterson ED, Gibson CM, Califf RM, Harrington RA, Ferguson TB. Impact of perioperative myocardial infarction on angiographic and clinical outcomes following coronary artery bypass surgery: findings from PREVENT IV. *Am J Cardiol*. 2008; 102: 546-51.
9. Kosiborod M, Inzucchi SE, Krumholz HM, Masoudi FA, **Goyal A**, Xiao L, Jones PG, Fiske S, Spertus JA. Glucose normalization and outcomes in patients with acute myocardial infarction. *Arch Intern Med*. 2009; 169: 438-446.
10. * **Goyal A**, Mehta SR, Gerstein HC, Díaz R, Afzal R, Xavier D, Zhu J, Pais P, Lisheng L, Kazmi KA, Zubaid M, Piegas LS, Widimsky P, Budaj A, Avezum A, Yusuf S. Glucose levels compared with diabetes history in the risk assessment of acute myocardial infarction patients. *Am Heart J*. 2009; 157: 763-70.
11. Kosiborod M, Inzucchi SE, **Goyal A**, Krumholz HM, Masoudi FA, Xiao L, Spertus JA. Relationship between spontaneous and iatrogenic hyperglycemia and mortality in patients hospitalized with acute myocardial infarction. *JAMA*. 2009; 301: 1556-1564.
12. * **Goyal A**, Mehta SR, Diaz R, Gerstein HC, Afzal R, Xavier D, Lisheng L, Pais P, Yusuf S. Differential clinical outcomes associated with hypoglycemia and hyperglycemia in acute myocardial infarction. *Circulation*. 2009; 120: 2429-2437.
13. Petersen JL, Yow E, AlJaroudi W, Shaw LK, **Goyal A**, McGuire DK, Peterson ED, Harrington RA. Metabolic syndrome is not associated with increased mortality or cardiovascular risk in non-diabetic patients with a new diagnosis of coronary artery disease. *Circ Cardiovasc Qual Outcomes*. 2010; 3: 165-172.
14. † Kulshreshtha A, Kvedar JC, **Goyal A**, Halpern E, Watson A. Use of remote monitoring to improve outcomes in patients with heart failure: a pilot trial. *Int J Telemedicine Applications*. 2010; Article # 870959, 7 pages. Available online at <http://downloads.hindawi.com/journals/ijta/2010/870959.pdf>.
15. * **Goyal A**, Bhatt DL, Steg PG, Gersh BL, Alberts MJ, Ohman EM, Corbalán R, Eagle KA, Gaxiola E, Gao R, Goto S, D'Agostino RB, Califf

RM, Smith SC, Wilson PW. Attained educational level and incident atherothrombotic events in low-and-middle income compared with high-income countries. *Circulation*. 2010; 122: 1167-1175.

16. *† **Goyal A**, Norton CR, Thomas TN, Davis RL, Butler J, Ashok V, Zhao L, Vaccarino V, Wilson PW. Predictors of incident heart failure in a large insured population: a one million person-year follow-up study. *Circ Heart Fail*. 2010; 3: 698-705.
17. Nerenberg KA, **Goyal A**, Xavier D, Sigamani A, Ng J, Mehta SR, Díaz R, Kosiborod M, Yusuf S, Gerstein HC. Piloting a novel algorithm for glucose control in the CCU: the RECREATE (REsearching Coronary REduction by Appropriately Targeting Euglycemia) Trial. *Diabetes Care* 2012. 35: 19-24.
18. * **Goyal A**, Spertus JA, Gosch K, Venkitachalam L, Jones PG, van den Berghe G, Kosiborod M. Serum potassium levels and mortality in acute myocardial infarction. *JAMA*. 2012; 307: 157-64.
19. † Kulshreshtha A, Anderson LM, **Goyal A**, Keenan NL. Stroke in South Asia: systematic review of epidemiologic literature from 1980 to 2010. *Neuroepidemiology*. 2012; 38: 123-129.
20. Beckowski MS, **Goyal A**, Goetzel RZ, Rinehart CL, Darling KJ, Yarborough CM. Developing alternative methods for determining the incidence, prevalence, and cost burden of coronary heart disease in a corporate population. *J Occup Environ Med*. 2012; 54: 1026-1038.
21. Cai Y, Lu L, Zhu J, **Goyal A**, Huang C, Redmond P, Li N, Ma J. Social, psychological, and environmental-structural factors associated with tobacco experimentation among adolescents in Shanghai, China. *Int J Environ Res Public Health*. 2012; 9: 3421-36.
22. L Cai, X Wu, **A Goyal**, Y Han, W Cui, X Xiao, J He, K Zhao, Y Song, F Jiao. Patterns and socioeconomic influences of tobacco exposure in tobacco cultivating rural areas of Yunnan Province, China. *BMC Public Health*. 2012; 12: Article # 842. Available online at <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-842>
23. Terry PD, **Goyal A**, Phillips LS, Superak HM, Kutner MH. Design and rationale of a randomized controlled trial of melatonin supplementation in men and women with the metabolic syndrome. *Open Access J Clin Trials* 2013; 5: 51-59. Available online at <http://dx.doi.org/10.2147/OAJCT.S39551>

24. L Cai, X Wu, **A Goyal**, Y Han, W Cui, J He, X Xiao, K Zhao, F Jiao, Y Song. Multilevel analysis of the determinants of smoking and secondhand smoke exposure in a tobacco-cultivating rural area of southwest China. *Tob Control*. 2013; 22 (suppl 2): ii16-ii20. doi:10.1136/tobaccocontrol-2012-050850
25. Arnold SV, Lipska KJ, Li Y, **Goyal A**, Maddox TM, McGuire DM, Spertus JA, Kosiborod M. The reliability and prognosis of in-hospital diagnosis of metabolic syndrome in the setting of acute myocardial infarction. *J Am Coll Cardiol*. 2013; 62: 704-708.
26. † Kulshreshtha A, Vaccarino V, Judd S, Howard VJ, McClellan W, Muntner P, Hong Y, Safford M, **Goyal A**, Cushman M. Life's Simple 7 and risk of incident stroke in black and white Americans: REasons for Geographic And Racial Differences in Stroke (REGARDS) Study. *Stroke*. 2013; 44: 1909-1914.
27. Venkitachalam L, McGuire DK, Gosch K, Lipska K, Inzucchi SE, Lind M, **Goyal A**, Spertus JA, Masoudi FA, Jones PG, Kosiborod M. Temporal trends and hospital variation in the management of severe hyperglycemia among patients with acute myocardial infarction in the United States. *Am Heart J*. 2013; 166: 315-324.e1.
28. Kay J, Dorbala S, **Goyal A**, Fazel R, Di Carli MF, Einstein AJ, Beanlands RS, Merhige ME, Williams BA, Veledar E, Chow BJ, Min JK, Berman DS, Shah S, Bellam N, Butler J, Shaw LJ. Influence of sex on risk stratification with stress myocardial perfusion Rb-82 positron emission tomography: results from the PET prognosis multicenter registry. *J Am Coll Cardiol*. 2013; 62: 1866-1876.
29. † Kulshreshtha A, **Goyal A**, Veledar E, McClellan W, Judd S, Eufinger S, Bremner DJ, Goldberg J, Vaccarino V. Association between ideal cardiovascular health and carotid intima-media thickness: a twin study. *J Am Heart Assoc*. 2014; 3: e000282. doi:10.1161/JAHA.113.000282.
30. † Kulshreshtha A, **Goyal A**, Dabhadkar K, Veledar E, Vaccarino V. Urban-rural differences in coronary heart disease mortality in United States: 1999-2009. Public Health Reports. *Public Health Reports*. 2014; 129 :19-29.
31. Shaw LJ, Berman DS, Stone GW, Picard MH, Friedrich MG, Kwong RY, Senior R, Min JK, Hachamovitch R, Scherrer-Crosbie M, Mieres JH, Marwick TH, Philips LM, Chaudhry FA, Pellikka PA, Slomka P, Arai AE, Iskandrian AE, Bateman TM, Heller GV, Miller TD, Nagel E, **Goyal A**, Borges-Neto S, Boden WE, Reynolds HR, Hochman JS, Maron DJ, Douglas PS. Comparative definitions for moderate-severe ischemia in

stress nuclear, echocardiography, and magnetic resonance imaging. *J Am Coll Cardiol Img.* 2014; 7:593-604.

32. † Flueckiger P, Pastan S, **Goyal A**, McClellan WW, Patzer RE. Associations of ECG interval prolongations with mortality among ESRD patients evaluated for renal transplantation. *Ann Transplant.* 2014; 19: 257-68.
33. Arnold SV, Spertus JA, Lipska KJ, Lanfear DE, Tang F, Grodzinsky A, McGuire DK, Spertus JA, Gore MO, **Goyal A**, Maddox TM, Kosiborod M. Type of beta-blocker use among patients with versus without diabetes after myocardial infarction. *Am Heart J.* 2014; 168: 273-9.e1. doi: <http://dx.doi.org/10.1016/j.ahj.2014.04.018>
34. Arnold SV, Lipska KJ, Inzucchi SE, Li Y, Jones PG, McGuire DK, **Goyal A**, Stolker JM, Lind M, Spertus JA, Kosiborod M. The reliability of in-hospital diagnoses of diabetes mellitus in the setting of acute myocardial infarction. *BMJ Open Diab Res Care.* 2014; 2: e000046 doi:10.1136/bmjdr-2014-000046
35. † **Goyal A**, Terry PD, Superak HM, Nell-Dybdahl CL, Chowdhury R, Phillips LS, Kutner MH. Melatonin supplementation to treat the metabolic syndrome: a randomized controlled trial. *Diabetol Metab Syndr.* 2014; 6:124. doi:10.1186/1758-5996-6-124.
36. Arnold SV, Lipska KJ, Li Y, McGuire DK, **Goyal A**, Spertus JA, Kosiborod M. Prevalence of glucose abnormalities among patients presenting with an acute myocardial infarction. *Am Heart J.* 2014; 168: 466-70.e1. doi:10.1016/j.ahj.2014.06.023
37. † Kulshreshtha A, Vaccarino V, **Goyal A**, McClellan W, Nahab F, Howard VJ, Judd SE. Family history of stroke and cardiovascular health in a national cohort. *J Stroke Cerebrovasc Dis.* 2015; 24: 447-54.
38. Arnold SV, Spertus JA, Lipska KJ, Tang F, **Goyal A**, McGuire DK, Cresci S, Maddox TM, Kosiborod M. Association between diabetes mellitus and angina after acute myocardial infarction: analysis of the TRIUMPH prospective cohort study. *Eur J Prev Cardiol.* 2015; 22: 779-87.
39. Arnold SV, Stolker JM, Lipska KJ, Jones PG, Spertus JA, McGuire DK, Inzucchi SE, **Goyal A**, Maddox TM, Lind M, Gumber D, Shore S, Kosiborod M. Recognition of incident diabetes mellitus during an acute myocardial infarction. *Circ Cardiovasc Qual Outcomes.* 2015; 8: 260-7.
40. El Chami M, Levy M, Kelli HM, Casey M, Hoskins MH, **Goyal A**, Langberg JL, Patel A, DeLurgio D, Lloyd MS, Leon AR, Merchant FM. Outcome of

subcutaneous implantable cardioverter defibrillator implantation in patients with end-stage renal disease on dialysis. *J Cardiovasc Electrophysiol.* 2015; 26: 900-904.

41. † Cashion W, McClellan W, Howard G, **Goyal A**, Kleinbaum D, Goodman M, Prince V, Muntner P, McClure LA, McClellan A, Judd S. Geographic region and racial variations in polypharmacy in the United States. *Ann Epidemiol.* 2015; 26: 433-8.e1
42. * **Goyal A**, de Lemos JA, Peng SA, Thomas L, Amsterdam EA, Hockenberry JM, Peterson ED, Wang TY. Association of patient enrollment in Medicare Part D with outcomes after acute myocardial infarction. *Circ Cardiovasc Qual Outcomes.* 2015; 8: 567-75.
43. Grodzinsky A, **Goyal A**, Gosch K, McCullough PA, Fonarow GC, Mebazaa A, Masoudi FA, Spertus JA, Palmer B, Kosiborod M. Prevalence and prognosis of hyperkalemia in patients with acute myocardial infarction. *Am J Med.* 2016; 129: 858-65.
44. Pandey A, McGuire DK, de Lemos JA, Das SR, Berry J, Brilakis ES, Banerjee S, Marso SP, Barsness GW, Simon DN, Roe M, **Goyal A**, Kosiborod M, Amsterdam EA, Kumbhani DJ. Revascularization trends in patients with diabetes mellitus and multivessel coronary artery disease presenting with non-ST elevation myocardial infarction: insights from the NCDR ACTION Registry-GWTG. *Circ Cardiovasc Qual Outcomes.* 2016; 9: 197-205.
45. Arnold SV, Spertus JA, Jones PG, McGuire DK, Lipska KJ, Xu Y, Stolker JM, **Goyal A**, Kosiborod M. Predicting adverse outcomes after myocardial infarction among patients with diabetes mellitus. *Circ Cardiovasc Qual Outcomes.* 2016; 9: 372-9.
46. Doll JA, Hellkamp AS, **Goyal A**, Sutton NR, Peterson ED, Wang TY. Treatment, outcomes, and adherence to medication regimens among dual Medicare-Medicaid-eligible adults with myocardial infarction. *JAMA Cardiol.* 2016; 1: 787-794.
47. Vera A, Wang T, Hellkamp A, Thomas L, Henry TD, **Goyal A**, Roe M. Differences in short- and long-term outcomes among older patients with ST-elevation versus non-ST-elevation myocardial infarction with angiographically proven coronary artery disease. *Circ Cardiovasc Qual Outcomes.* 2016; 9: 513-22.
48. † Witbrodt B, **Goyal A**, Kelkar AA, Dorbala S, Chow BJ, Di Carli MF, Williams BA, Merhige ME, Berman DS, Germano G, Beanlands RS, Min JK, Arasaratnam P, Sadreddini M, van Velthuisen ML, Shaw LJ.

Prognostic significance of blood pressure response during vasodilator stress Rb-82 positron emission tomography myocardial perfusion imaging. *J Nuclear Cardiol.* 2017; 24: 1966-75.

49. Pandey A, Golwala H, Hall HM, Wang TY, Lu D, Xian Y, Chiswell K, Joynt KE, **Goyal A**, Das SR, Kumbhani D, Julien H, Fonarow GC, de Lemos JA. Association of US Centers for Medicare and Medicaid Services hospital 30-day risk-standardized readmission metric with care quality and outcomes after acute myocardial infarction: findings from the NCDR ACTION Registry-GWTG. *JAMA Cardiol.* 2017; 2: 723-731.
50. El-Chami MF, Matar L, Smith P, Casey M, Adish MA, Kelly K, Wood C, Merlino J, **Goyal A**, Leon AR, Merchant FM. Long-term survival of implantable cardioverter defibrillator recipients with end-stage renal disease. *J Arrhythm.* 2017; 33: 459-62.
51. Shah AD, Peddareddy LP, Addish MA, Kelly K, Patel AU, Casey M, **Goyal A**, Leon AR, El-Chami MF, Merchant FM. Procedural outcomes and long-term survival following trans-venous defibrillator lead extraction in patients with end-stage renal disease. *EP Europace.* 2017; 19: 1994-2000.
52. Arnold SV, **Goyal A**, Inzucchi SE, McGuire DK, Tang F, Mehta SN, Sperling LS, Maddox TM, Einhorn D, Wong ND, Hammar N, Fenici P, Khunti K, Lam CSP, Kosiborod M. Quality of care of the initial patient cohort of the Diabetes Collaborative Registry. *J Am Heart Assoc.* 2017; 6: pii e005999. doi: 10.1161/JAHA.117.005999
53. † Xie JX, Eshtehardi P, Varghese T, **Goyal A**, Mehta P, Kang W, Leipsic J, Hartaigh B, Bairey Merz CN, Berman DS, Gransar H, Budoff MJ, Achenbach S, Callister T, Marques H, Rubinshtein R, Al-Mallah MH, Andreini D, Pontone G, Cademartiri F, Maffei E, Chinnaiyan K, Raff G, Hadamitzky M, Hausleiter J, Feuchtner G, Kaufmann PA, Villines TC, Chow BJW, Min JK, Shaw LJ. Prognostic significance of nonobstructive left main coronary artery disease in women versus men: long-term outcomes from the CONFIRM Registry. *Circ Cardiovasc Imaging.* 2017; 10: e006246. doi: 10.1161/CIRCIMAGING.117.006246
54. Arnold SV, Inzucchi SE, Tang F, McGuire DK, Mehta SN, Maddox TM, **Goyal A**, Sperling LS, Einhorn D, Wong ND, Kosiborod M. Real-world use and modeled impact of glucose-lowering therapies evaluated in recent cardiovascular outcomes trials: an NCDR research to practice project. *Eur J Prev Cardiol.* 2017; 24:1637-1645.
55. Grodzinsky A, Kosiborod M, Tang F, Jones PG, McGuire DK, Spertus JA, Beltrame J, Jang JS, **Goyal A**, Butala N, Yeh R, Arnold SV. Residual angina following elective percutaneous coronary intervention in patients

with diabetes mellitus. *Circ Cardiovasc Qual Outcomes*. 2017; 10: pii: e003553. doi: 10.1161/CIRCOUTCOMES.117.003553

56. Mody P, Wang T, McNamara R, Das S, Li S, Chiswell K, Tsai T, Kumbhani D, Wiviott S, **Goyal A**, Roe M, de Lemos JA. Association of acute kidney injury and chronic kidney disease with processes of care and long-term outcomes in patients with acute myocardial infarction. *Eur Heart J Qual Care Clin Outcomes*. 2018; 4: 43-50.
57. *† Shin EY, Ochuko P, Bhatt K, Howard B, McGorisk G, Delaney L, Langdon K, Khosravanipour M, Nambi AA, Grahovec A, Morris DC, Castellano PZ, Shaw LJ, Sperling LS, **Goyal A**. Electronic health record-based overestimation of failure to prescribe statins in patients with coronary artery disease in a large, academic, multispecialty clinic practice. *J Am Heart Assoc*. 2018; 7: e007762. DOI: 10.1161/JAHA.117.007762. (Oral presentation and winner of the Young Investigator Competition at the 2017 American Heart Association Quality of Care and Outcomes Research Conference in Arlington, VA.)
58. Shaw LJ, **Goyal A**, Mehta C, Xie J, Phillips L, Kelkar A, Knapper J, Berman DS, Nasir K, Veledar E, Blaha MJ, Blumenthal R, Min JK, Fazel R, Wilson PWF, Budoff MJ. Ten-year resource utilization and costs for cardiovascular care. *J Am Coll Cardiol*. 2018; 71: 1078-89.
59. Arnold SV, Echouffo-Tcheugui J, Lam CSP, Inzucchi SE, Tang F, McGuire DK, **Goyal A**, Maddox TM, Sperling LS, Fonarow GC, Masoudi FA, Kosiborod M. Patterns of glucose-lowering medication use in patients with type 2 diabetes and heart failure. Insights from the Diabetes Collaborative Registry (DCR). *Am Heart J*. 2018. 203: 25-29.
60. Arnold SV, McGuire DK, Inzucchi SE, Tang F, Mehta SN, Lam CSP, **Goyal A**, Sperling LS, Wong ND, Hammer N, Fenici P, Kosiborod M. Assessing use of patient-focused pharmacotherapy in glycemic management through the Diabetes Collaborative Registry (DCR). *J Diabetes Complications*. 2018; 32: 1035-1039.
61. Merchant FM, Desai Y, Addish MA, Kelly K, Casey M, **Goyal A**, Leon AR, El-Chami MF. Implantable cardioverter-defibrillator placement for primary prevention in 2,346 patients: predictors of one-year survival. *Tex Heart Inst J*. 2018; 45: 221-5.
62. Rymer J, Chen A, Thomas L, Stafford J, Enriquez J, **Goyal A**, Peterson E, Wang T. Advanced practice provider versus physician-only outpatient follow-up after acute myocardial infarction. *J Am Heart Assoc*. 2018; 7: e008481. doi: 10.1161/JAHA.117.008481.

63. Bagai A, Lu D, Lucas J, **Goyal A**, Herzog CA, Wang TY, Goodman SG, Roe MT. Temporal trends in utilization of cardiac therapies and outcomes for myocardial infarction by degree of chronic kidney disease: a report from the NCDR Chest Pain-MI Registry. *J Am Heart Assoc.* 2018; 7: e010394. doi: 10.1161/JAHA.118.010394.
64. Guimarães PO, Zakrotsky P, **Goyal A**, Lopes RD, Kaltenbach L, Wang TY. Usefulness of antithrombotic therapy in patients with atrial fibrillation and acute myocardial infarction. *Am J Cardiol.* 2019; 123: 12-18.
65. Desai NR, Udell JA, Wang Y, Spatz ES, Dharmarajan K, Ahmad T, Julien HM, Annapureddy A, **Goyal A**, de Lemos JA, Masoudi FA, Bhatt DL, Minges KE, Krumholz HM, Curtis JP. Trends in performance and opportunities for improvement on a composite measure of acute myocardial infarction care: findings from the National Cardiovascular Data Registry. *Circ Cardiovasc Qual Outcomes.* 2019; 12: e004983. DOI: 10.1161/CIRCOUTCOMES.118.004983.
66. Arnold SV, Seman L, Tang F, Periokony PA, Ferdinand KC, Mehta SN, **Goyal A**, Sperling LS, Kosiborod M. Real-world opportunity of empagliflozin to improve blood pressure control in African Americans with type 2 diabetes: an NCDR® “research-to-practice” project from the Diabetes Collaborative Registry (DCR). *Diabetes Obes Metab.* 2019; 21: 393-396.
67. Bagai A, Chen A, Udell J, Dodson J, McManus D, Maurer M, Enriquez J, Hochman J, **Goyal A**, Henry T, Gulati M, Garratt K, Roe M, Alexander K. Association of cognitive impairment with treatment and outcomes in older myocardial infarction patients: a report from the NCDR Chest Pain-MI Registry. *J Am Heart Assoc.* 2019;8:e012929. <https://doi.org/10.1161/JAHA.119.012929>
68. Amin AP, McNeely C, Spertus JA, Bach RG, Frogge N, Lindner S, Jain S, Bradley SM, Wafsy JH, **Goyal A**, Maddox T, House JA, Kulkarni H, Masoudi FA. The incremental cost of acute kidney injury after percutaneous coronary intervention. *Am J Cardiol.* 2020;125:29-33. DOI:<https://doi.org/10.1016/j.amjcard.2019.09.042>
69. Pandey A, Keshvani N, Khera R, Lu D, Vaduganathan M, Joynt-Maddox KE, Das SR, Kumbhani D, **Goyal A**, Girotra S, Chan P, Fonarow GC, Matsouaka R, Wang TY, de Lemos JA. Temporal trends in racial differences in 30-day readmission and mortality rates for acute myocardial infarction among Medicare beneficiaries: an analysis from the NCDR Chest Pain-MI Registry. *JAMA Cardiology.* 2020. Published online January 8, 2020. doi:10.1001/jamacardio.2019.4845

70. Amin AP, Spertus JA, Kulkarni H, McNeely C, Rao SV, Pinto D, House JA, Messenger JC, Bach RG, **Goyal A**, Shroff A, Pancholy S, Bradley SM, Gluckman TJ, Maddox TM, Wasfy JH, Masoudi FA. Improving care pathways for acute coronary syndrome: patients undergoing percutaneous coronary intervention. *Am J Cardiol.* 2020;125:354-61. DOI: <https://doi.org/10.1016/j.amjcard.2019.10.019>
71. *† Xie JX, Kobashigawa JA, Kennedy KF, Henry TD, Tabak SW, Krebs R, Shaw L, Abbott JD, Book W, Rab ST, Spertus JA, **Goyal A**. Omission of heart transplant recipients from the Appropriate Use Criteria for Revascularization and its impact on heart transplant centers. 2020. *JAMA Cardiol.* 2020. Published online April 08, 2020. doi:10.1001/jamacardio.2020.0586
72. Arnold SV, Gosch K, Wong ND, Hejjaji V, **Goyal A**, Leiter LA, Kosiborod M. Use of non-LDLc lipid-lowering medications in patients with type 2 diabetes. *Endocrinol Diab Metab.* 2020;00:e00126. doi: <https://doi.org/10.1002/edm2.126>

b. Manuscripts Submitted (original research articles submitted to refereed journals)

73. Cashion W, McClellan W, Judd S, **Goyal A**, Kleinbaum D, Goodman M, Prince V, Muntner P, Howard G. Polypharmacy and mortality association by chronic kidney disease status: the REGARDS study. 2020. Submitted.
74. Bradley S, Adusumalli A, Amin A, Borden W, Das S, Downey W, Ebinger J, Gelbman J, Gluckman T, **Goyal A**, Gupta D, Khot U, Levy A, Mutharasan RK, Rush P, Strauss C, Ho PM. The Cardiovascular Quality Improvement and Care Innovation Consortium (CV-QUIC): inception of a multicenter collaborative to improve cardiovascular care. 2020. Submitted.
75. Jacobs A, Ali M, Best PJ, Bieniarz M, Cohen M, French W, Fonarow G, Granger C, **Goyal A**, Henry T, Hollowell L, Jneid H, Jollis J, Katz J, Mason P, Menon V, Redlener M, Tamis-Holland J, Zègre-Hemsey J. Temporary emergency guidance to STEMI systems of care during the COVID-19 pandemic: AHA's Mission: Lifeline. 2020. Submitted.

c. Review Articles and Special Reports

76. **Goyal A**, Petersen JL, Mahaffey KW. The evaluation and management of dyslipidemia and impaired glucose metabolism during acute coronary syndromes. *Curr Cardiol Rep.* 2004; 6: 300-7.

77. Shah S, Patel M, **Goyal A**, Amos A, Baeza R, Halabi A, Lam G, Mitchell R, Oliveria GB, Valente A. Highlights from the American Heart Association Annual Scientific Sessions 2004: November 7-10, 2004. *Am Heart J*. 2005; 149: 240-253.
78. Patel MR, Baeza RG, **Goyal A**, Halabi A, Melloni C, Oliveira GB, Tricoci P, Valente A. Highlights from the American College of Cardiology Annual Scientific Sessions 2005: March 6-9, 2005, Orlando, Florida. *Am Heart J*. 2005; 149: 1009-1019.
79. * **Goyal A**, Blazing MA. Should we measure C-reactive protein levels to ascertain the adequacy of statin therapy in patients who are at very high risk for a coronary heart disease event? *Am Heart J*. 2005; 150: 650-651.
80. * **Goyal A**, Tricoci P, Melloni C, Mills JS, Thomas KL, Adams GL, Mitchell R, Turer A. Highlights from the American Heart Association Scientific Sessions 2005: November 13-16, 2005. *Am Heart J*. 2006; 151: 295-307.
81. * **Goyal A**, Mills JS, Tricoci P, Thomas KL, Baeza R, Adams GL, Melloni C. Highlights from the 55th Annual Scientific Sessions of the American College of Cardiology: March 11-14, 2006, Atlanta, Georgia. *Am Heart J*. 2006; 151: 1156-72.
82. * **Goyal A**, Yusuf S. The burden of cardiovascular disease in the Indian subcontinent. *Indian J Med Res*. 2006; 124: 235-44.
83. Xavier D, Devereaux PJ, **Goyal A**, Pais P, Yusuf S. Polypharmacotherapy for primary prevention of cardiovascular disease. *Indian Heart J*. 2008; 60 (2 Suppl B): B29–B33.
84. * **Goyal A**, Nerenberg K, Gerstein HC, Umpierrez G, Wilson PWF. Insulin therapy in acute coronary syndrome: a current appraisal of completed and ongoing randomized trials with important clinical endpoints. *Diabetes Vasc Dis Res*. 2008; 5: 276-84.
85. Bajpai A, **Goyal A**, Sperling L. Should we measure CRP on earth or just on JUPITER? *Clin Cardiol*. 2010; 33: 190-198.
86. † Abd TT, Eapen DJ, Bajpai A, **Goyal A**, Dollar A, Sperling L. The role of C-reactive protein as a risk predictor of coronary atherosclerosis: implications from the JUPITER trial. *Curr Atheroscler Rep*. 2011; 13: 154-61.

87. † Shen J, **Goyal A**, Sperling LS. The emerging epidemic of obesity, diabetes, and the metabolic syndrome in China. *Cardiol Res Pract.* 2012; 2012:178675. doi:10.1155/2012/178675.
88. McDaniel M, Ross MA, Rab ST, Keadey M, Liberman H, Fantz CR, Winkler A, **Goyal A**, Finn A, Osborne AD, Lowery-North D, Mavromatis K, Morris DC, Samady H. A comprehensive acute coronary syndrome algorithm for centers with percutaneous coronary intervention capability. *Crit Pathways Cardiol.* 2013; 12: 141-9.
89. Phillips LM, Hachamovitch R, Berman DS, Iskandrian AE, Min JK, Picard MH, Kwong RY, Friedrich M, Scherer-Crosbie M, Hayes S, Sharir T, Gosselin G, Mazzanti M, Senior R, Beanlands R, Smanio P, **Goyal A**, Al Mallah M, Reynolds H, Stone G, Maron D, Shaw LJ. Lessons learned from MPI and physiologic testing in randomized trials of stable ischemic heart disease: COURAGE, BARI-2D, FAME, ISCHEMIA. *J Nuclear Cardiol.* 2013; 20: 969-75.
90. McCullough PA, Beaver TM, Bennett-Guerrero E, Emmett M, Fonarow GC, **Goyal A**, Herzog CA, Kosiborod M, Palmer BF. Acute and chronic cardiovascular effects of hyperkalemia: new insights into prevention and clinical management. *Rev Cardiovasc Med.* 2014; 15: 11-23.
91. Shaw LJ, Xie JX, Phillips LM, **Goyal A**, Reynolds HR, Berman DS, Picard MH, Bhargava B, Devlin G, Chaitman BR. Optimizing diagnostic accuracy with the exercise ECG: opportunities for women and men with stable ischemic heart disease. *Heart Asia* 2016; 8: 1-7.
92. **Goyal A**, Gluckman TJ, Tcheng JE. What's in a name? The new ICD-10 codes and type 2 myocardial infarction. *Circulation.* 2017; 136: 1180-2. DOI: 10.1161/CIRCULATIONAHA.117.030347
93. **Goyal A**, Gluckman TJ, Levy A, Mariani D, Perez C, Rose GA, Sweeney S, Thompson RC, Waites J, Tcheng JE. Translating the Fourth Universal Definition of Myocardial Infarction into clinical documentation: ten pearls for frontline clinicians. *Cardiology.* November 2019. Accessed at <https://www.acc.org/latest-in-cardiology/articles/2018/11/06/12/42/translating-the-fourth-universal-definition-of-myocardial-infarction-into-clinical-documentation-ten-pearls-for-frontline-clinicians>
94. Mills LB, Sweeney S, Little L, Goyal A. Red flags for myocardial infarctions coding and clinical documentation improvement. *Journal of AHIMA.* 2019; 7: 54-55. Accessed at <http://bok.ahima.org/doc?oid=302775#.XUitzC2ZP-Z> on August 5, 2019.

95. Nave J, **Goyal A**. When is a troponin elevation an acute myocardial infarction? 2019. *The Hospitalist*. Accepted.

d. Editorials and Letters

96. * **Goyal A**, Mahaffey KW, Garg J, Nicolau JC, Hochman JS, Weaver WD, Oliveira GB, Todaro TG, Granger CB. Glucose, insulin, and acute myocardial infarction: reply. Letter. *Eur Heart J*. 2006; 27: 2142-3.
97. * **Goyal A**, Díaz R, Mehta SR. Glucose-insulin-potassium therapy in acute ST-segment elevation myocardial infarction: reply. Letter. *JAMA*. 2008; 299: 2387-2388.
98. Kosiborod M, Inzucchi SE, Krumholz HM, Masoudi FA, **Goyal A**, Spertus JA. Is insulin the preferred compound in lowering glucose levels in patients after a myocardial infarction? – Reply. Letter. *Arch Intern Med*. 2009; 169: 1633-1638.
99. * **Goyal A**, Mehta SR, Diaz R, Gerstein HC, Afzal R, Xavier D, Lisheng L, Pais P, Yusuf S. “Response to letter regarding article, ‘Differential clinical outcomes associated with hypoglycemia and hyperglycemia in acute myocardial infarction.’” Letter. *Circulation*. 2010; 122: e397.
100. * **Goyal A**, Bhatt DL, Steg PG, Gersh BL, Alberts MJ, Ohman EM, Corbalán R, Eagle KA, Gaxiola E, Gao R, Goto S, D’Agostino RB, Califf RM, Smith SC, Wilson PW. “Response to letter regarding article, ‘Attained educational level and incident atherothrombotic events in low-and-middle income compared with high-income countries.’” Letter. *Circulation*. 2011; 123: e606.
101. * **Goyal A**, Spertus JA, Kosiborod M. Potassium levels after acute myocardial infarction – reply. Letter. *JAMA*. 2012; 307: 1578-80.
102. * **Goyal A**, Bornstein WA. Health system-wide quality programs to improve blood pressure control. Editorial. *JAMA*. 2013; 310: 695-6
103. Arnold SV, Inzucchi SE, McGuire DK, Mehta SN, **Goyal A**, Sperling LS, Maddox TM, Einhorn D, Wong ND, Ratner RE, Hammar N, Fenici P, Sheehan JJ, Wong JL, Kosiborod M. Evaluating the quality of comprehensive cardiometabolic care for patients with type 2 diabetes in the United States: The Diabetes Collaborative Registry®. Research letter. *Diabetes Care* 2016; e99-e101. doi: 10.2337/dc16-0585.
104. Shafiq A, **Goyal A**, Jones PG, Sahil S, Hoffman M, Qintar M, Buchanan DM, Kosiborod M, Arnold S. Serum magnesium levels and in-hospital

mortality in acute myocardial infarction. Research letter. *J Am Coll Cardiol.* 2017; 69: 2771-72.

105. **Goyal A**, Tabak SW, Henry TD, Kobashigawa JA. Omission of heart transplant recipients from the 2017 Appropriate Use Criteria for Coronary Revascularization in Patients with Stable Ischemic Heart Disease. Editorial. *Catheter Cardiovasc Interv.* 2018; 92: 451.
106. Fordyce CB, Chen AY, Wang TY, Lucas J, **Goyal A**, Wong GC, van Diepen S, Kontos MC, Henry TD, Granger CB, Roe MT. Patterns of use of targeted temperature management for acute myocardial infarction patients following out-of-hospital cardiac arrest: insights from the National Cardiovascular Data Registry. Research letter. *Am Heart J.* 2018; 206: 131-3.

e. Published Abstracts (excluding those already published as manuscripts)

107. Al-Khatib SM, **Goyal A**, Hafley GE, Alexander JH, Mack MJ, Wolf RK, Cohn LH, Gennevois D, Harrington RA, Peterson ED, Lee KL, Califf RM, Kouchoukos NT, Ferguson Jr., TB. Short-term outcomes of atrial fibrillation complicating coronary artery bypass graft surgery: results from the PREVENT-IV trial. *J Am Coll Cardiol.* 2005; 45 (suppl A): 365A. Oral presentation, American College of Cardiology Annual Meeting 2005.
108. Alexander JH, Berger PB, Hafley G, **Goyal A**, Peterson ED, Harrington RA, Ferguson TB, Wolf RK, Mack MJ, Kouchoukos N, Califf RM, Gibson CM. Impact of early clopidogrel use on angiographic and clinical outcomes following coronary artery bypass surgery: findings from PREVENT IV. *J Am Coll Cardiol.* 2006; 47 (suppl A): 178A. Poster presentation, American College of Cardiology Annual Meeting 2006.
109. **Goyal A**, Thomas TN, Barzilay J, Davis RL, Vaccarino V, Wilson PW. Racial differences in the attainment of cardiovascular risk factor goals among insured adults with diabetes mellitus. *J Am Coll Cardiol.* 2010; 55: E1332. Poster presentation, American College of Cardiology Scientific Sessions 2010.
110. **Goyal A**, Stigaard L, Jeter M, Casey M, Vanairsdale S, Wilson J, Rab ST, Keadey MT, Osborne AD, Morris DC, Capes JP, Liberman H, Ross MA. Chasing the 90-minute target for First Medical Contact to Balloon (FMC2B) Time in EMS-transported STEMI patients at two teaching hospitals. *Circ Cardiovasc Qual Outcomes.* 2013; 6:A166. Poster presentation, American Heart Association Quality of Care and Outcomes Research 2013 Annual Conference, May 2013, Baltimore, MD.

111. Osborne AD, Moore A, Wheatley M, **Goyal A**, Schragger JS, Capes JP, Ross MA. First medical contact to balloon time in out-of-hospital activation of the cardiac catheterization laboratory with and without ECG transmission. *Ann Emerg Med.* 2013; 62: S46. Poster presentation, American College of Emergency Physicians 2013 Annual Conference, October 2013, Seattle, WA.
112. **Goyal A**, Steg PG, Smith, SC, Jr., Eagle KA, Ohman EM, Koplan JP, Hoffman EB, Im K, Goto S, Wilson PW, Bhatt DL. Cigarette smoking is associated with a greater hazard for adverse outcomes in women compared with men: insights from the global REACH registry. *Circulation.* 2013; 128: A13411. Poster presentation, American Heart Association 2013 Scientific Sessions, November 2013, Dallas, TX.
113. Osborne AD, **Goyal A**, Moore A, Knight GF, Sasser S, Ross MA, Wheatley MW. Screening normal electrocardiograms for ST-elevation myocardial infarct may not be needed. *Ann Emerg Med.* 2014; 64: S111. Poster presentation, American College of Emergency Physicians Research Forum, October 28, 2014, Chicago, IL.
114. † Witbrodt B, **Goyal A**, Woolfolk E, Morris AA. Ambulatory actigraphy monitoring of patients with heart failure with reduced ejection fraction predicts 6-minute walk distance. *J Am Coll Cardiol.* 2017; 69 (suppl): 744. Poster presentation, American College of Cardiology 2017, Washington DC, March 2017.
115. Arnold SV, Inzucchi SE, Tang F, McGuire DK, Mehta SN, Maddox TM, **Goyal A**, Sperling LS, Einhorn D, Wong ND, Kosiborod M. Using the Diabetes Collaborative Registry (DCR) to estimate the potential real-world impact of the IRIS Trial on improving outcomes in patients with cerebrovascular disease. *Circ Cardiovasc Qual Outcomes.* 2017; 10: A013. Poster presentation, 2017 American Heart Association Quality of Care and Outcomes Research Annual Conference, Arlington, VA, April 2017.
116. Udell JA, Lu D, Bagai A, Dodson JA, Desai NR, Fonarow GC, **Goyal A**, Garratt KN, Jucas J, Weintraub W, Forman D, Alexander KP, Roe MT. Frailty and mortality in older patients with acute myocardial infarction: observations from the NCDR ACTION Registry-GWTG. *Circulation.* 2017; 136 suppl 1: A15245. Poster presentation at the 2017 American Heart Association Scientific Sessions in November 2017.
117. † Chen JH, Vazquez JR, Hummel C, Kumarasamy M, Yam A, Esper GJ, **Goyal A**, Wells B. Gold star pilot program expedites early discharges from inpatient cardiology unit. *Circ Cardiovasc Qual Outcomes.* 2018; suppl 1: A248. Poster presentation, 2018 American Heart Association Quality of

Care and Outcomes Research Annual Conference, Arlington, VA, April 2018.

118. Pandey A, Khera R, Lu D, Vaduganathan M, Joynt-Maddox KE, Das SR, Kumbhani D, **Goyal A**, Girotra S, Chan P, Fonarow GC, Matsouaka R, Wang TY, de Lemos JA. Trends in racial differences in 30-day readmission rate for acute myocardial infarction among Medicare beneficiaries: an analysis from the NCDR Chest Pain-MI Registry. *J Am Coll Cardiol*. 2019; 73 (suppl 1): 260. Poster presentation, 2019 American College of Cardiology Annual Conference, New Orleans, LA, March 2019.
119. *† Xie JX, Kobashigawa JA, Kennedy KF, Henry TD, Tabak SW, Krebs R, Shaw L, Abbott JD, Book W, Rab ST, Spertus JA, **Goyal A**. Omission of heart transplant recipients from the Appropriate Use Criteria for Revascularization and its impact on heart transplant centers. *Circ Cardiovasc Qual Outcomes*. 2019; suppl 1: A196. Poster presentation, 2019 American Heart Association Quality of Care and Outcomes Research Annual Conference, Arlington, VA, April 2019.
120. Arnold SV, Kosiborod MN, Jones P, Beasley MH, **Goyal A**, Cordova JM, Fonarow GC, Seman LJ. Documentation of heart failure in outpatients with type 2 diabetes and evidence of volume overload: a report from the Diabetes Collaborative Registry (DCR). *Diabetes*. 2019; 68(suppl 1): 421-P. Poster presentation, 2019 American Diabetes Association Scientific Sessions, San Francisco, CA, June 2019.
121. † Fernandes M, Olarte N, Fernandes G, Toirac A, Maning J, Montanez-Valverde R, Bhatt K, Merchant F, **Goyal A**. Pacemaker therapy for the treatment of recurrent neurocardiogenic syncope: a systematic review and meta-analysis. Poster presentation, American Heart Association 2019 Annual Scientific Sessions, Philadelphia, PA.
122. Ali M, Best P, Bieniarz M, Fonarow GC, French WJ, Gallagher J, **Goyal A**, Granger C, Henry TD, Hollowell L, Jollis J, Kelly JJ, Redlener M, Stone H, Zegre-Hemsey J, Jacobs AK. Successes and ongoing opportunities in national efforts to improve STEMI care: Mission: Lifeline update 2010-2018. Poster presentation, American Heart Association 2019 Annual Scientific Sessions, Philadelphia, PA.
123. Knijik LM, Fernandes M, Rivera M, Cardoso R, McDaniel M, Liberman H, **Goyal A**, Sperling L, Cohen M. Antiplatelet duration strategies after percutaneous coronary intervention with stenting: systematic review and meta-analysis. Accepted, poster presentation, American College of Cardiology Annual Conference, Chicago, IL, March 28-30, 2020.

g. Manuals, Videos, Podcasts, Other Teaching Aids

124. **Goyal A.** YouTube video. Created a training video for emergency department nursing staff on the use of LifeNET ECG transmission software, Emory Healthcare, 2011. Accessed at http://www.youtube.com/watch?v=OwZ7-tHLjmE&feature=youtube_gdata_player
125. **Goyal A.** YouTube video. The Emory Algorithm for Defining and Documenting Acute Myocardial Infarction (MI) and Non-MI Causes of Elevated Troponin Levels. 2019. Accessed at: https://youtu.be/u4fAk9f_8WM
126. **Goyal A,** Pendley A. Podcast. Getting it right for our cardiology colleagues: troponin nomenclature and definition of acute myocardial infarction. 2019. Recorded on May 22, 2019, and currently in production.
127. **Goyal A,** DeMaria AN. American College of Cardiology ACCEL podcast. Translating the 4th Universal Definition of Myocardial Infarction into clinical documentation for front-line clinicians and health systems. Recorded April 14, 2020. Currently in production.

f. Other Publications – Clinical Trials Operations Documents

128. Lead author, clinical trial protocol for the international RECREATE randomized controlled trial. 2008.
129. Lead author, event adjudication process document for the international RECREATE randomized controlled trial. 2010.